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FOREST INSECT INVESTIGATIONS

REPORT ON THE FOREST INSECT CONTROL PROJECT

of the

TARGHEE NATIONAL FOREST FOR THE SEASON OF 1930

by

James C. Evenden
Entomologist

Forest Insect Field Station,
Coeur d'Alene, Idaho,
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of the
TANQUEER NATIONAL FOREST FOR THE SEASON OF 1930

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INTRODUCTION

This memorandum has been prepared for the twofold purpose of presenting the writer's reaction to the 1930 forest insect control project of the Targhee National Forest, and to attempt a summarization of the present status of the infestation, with recommendations for the continuance of control. Though this memorandum is based upon data secured from the Targhee Forest, it should be understood that this project was but a part of the general campaign of control conducted against the mountain pine beetle in the lodgepole pine stands of the Targhee, Teton, Wyoming, Caribou, and Cache National Forests. The writer regrets that he was unable to visit all of these Forests or to have even spent more time on the Targhee. However, in discussing this matter with Mr. Morse, who was in general charge of the entire project, it is believed that conditions observed upon the Targhee would be comparable to the other Forests. The writer has available for his consideration a complete report from the Targhee showing the results of a survey conducted during the month of September by local forest officers, for the purpose of securing an estimate of the 1930 infestation. Final reports from the other Forests are not yet available, but from information secured while in the region during September it is believed that comparable conditions exist within all the Forests of the project area. However, the writer wishes to be understood that statements relative to both the control operation of

1930 and the status of the 1930 reinfestation are based upon a visit to the Targhee in May and to the Targhee, Teton, and Wyoming in September.

1930 CONTROL OPERATION

The writer spent from May 15 to May 25 inclusive, with C. B. Morse in making an inspection of the insect control work on the Targhee National Forest. During this period seven camps were visited and considerable time spent in the woods at all areas with but one exception, where new snow prevented field work. The method of treating the infested trees was the same as practiced in 1929. The trunks of the standing infested trees were sprayed with an inflammable oil, and then burned. The oil adopted for this work is known as Fuel Oil, or Gas Oil, with a specification of 32 to 34 gravity, and a flash point of 160°. This oil seemed to be very satisfactory, burning a little longer than kerosene. Kerosene has a lower flash point and burns more freely, with better results during cold weather and days of high relative humidity. Gas Oil is better in warm weather and days of low relative humidity, and it is only on such days that the burning-standing method should be used.

The equipment used for spraying the oil upon the trees was practically the same as adopted in 1929; however, an improved nozzle and a 9-foot steel tubing extension made it possible to throw the oil to a greater height than had previously been obtained. With this improved equipment, though the treatments were not all of a 100 per cent character, the results secured were far more satisfactory than had been obtained in 1929. There are, of course, large, tall trees that can not

be satisfactorily treated by the burning-standing method, and in such cases these trees must be felled and treated if thorough control is to be secured. Furthermore, the use of this method is handicapped by such factors as wind, rain, and light snows, often making the work very unsatisfactory if continued under these conditions. It is necessary to provide for these factors through a change of working hours, cessation of operation until conditions become right for the use of this method, etc. A sincere attempt was made in 1930 to stop operations during unfavorable weather conditions, but this was not always done. However, with the limited funds available for the work on this project in 1930 there is no question but that through the use of this method a greater number of insects was destroyed for each dollar spent than could have been secured in any other way. Under these conditions the adoption of this treatment as a general method of control was the only procedure to follow.

The location of the infested trees by spotting crews or by the combination spotting and treating crews was very satisfactory. In all of the areas visited but very few infested trees were found that had been missed. In some areas the infested trees were located by spotting crews and subsequently treated by the burners. In other regions where the infestation was more scattered the trees were located and treated in one operation by a combination spotting and treating crew. It is not only difficult but nearly impossible to make a comparison of the advantages of these two methods. It would seem that there is a field for both of them, depending upon the nature of the terrain, character of the infestation, etc. In all of the areas

visited it would seem that the decision as to the character of the method to be used had been properly made by the forest officers in charge.

While nearly all of the crews, regardless of their composition, used a definite compass bearing in stripping the areas covered, a departure or two was made from this practice. While in some instances the use of a compass bearing may be a slight disadvantage in working out small areas or narrow strips of timber, it will be found that its use is the safest and most efficient practice.

This project had been very well organized, camps well established, location of the infested trees very satisfactory indeed, and the treatment of the trees as thorough as could be secured with the equipment and method in use. It is fully realized that at the time these camps were visited the work was just starting, and that all of the rough spots observed in organization, technique of treatment, etc. were satisfactorily ironed out in a very short time.

The writer's reaction to this project was very satisfactory. In every instance the forest officers in charge of camps or crews were energetic and enthusiastic in their efforts to make their part of the project a success. In all the areas with the exception of Trail Canyon and "The Outlet" (D-3) where the timber was exceptionally tall, it was felt that the treatment of the infested trees was very thorough. Taller trees will always be encountered that can not be thoroughly treated by the method in use. However, as stated there can be no

question but that, under the financial conditions that confronted the forest officers in charge of this project, the greatest number of insects was destroyed for the money expended, and consequently the greatest protection given to the forested areas in question.

1930 INFESTATION

To secure an estimate of the 1930 attack for the purpose of measuring the results of control and to plan for the continuance of the project, a survey of the infested areas on the Forests involved in this project was made in September by the local officers. A table taken from Supervisor Stoddard's (Targhee National Forest) report to the Regional Forester under date of October 10, 1930, follows.

Table taken from Supervisor Stoddard's Report of
Targhee Survey of 1930

Unit	Acres	Trees treated 1930	1930 Attacks	Increase or Decrease
D-1. Pleasant Valley	1251	903	374	-59%
Cottonwood	327	1389	690	-50%
Battlement	545	1733	1090	-37%
D-2.	640	3433	150	-94%
D-3.	2500	2159	200	-91%
D-4. Trail Canyon	2500	3616	1200	-67%
Fish Creek	1300	1935	550	-72%
Porcupine	4800	1077	850	-81%
Squirrel Creek	2000	1266	320	-75%
Dry Creek	10900	1191	2000	-68%
D-5.	600	255	--	
D-6. Milk Cr.-Pony Cr.	3000	1750	275	-91%
Packsaddle-Horsehoe	5500	2389	180	-94%
Hohogony-South	5700	1845	445	-73%
D-7. Kirishan Hollow	5000	2625	749	-72%
Graham Hollow- Wolverine	9600	1221	--	-100%
Warm Creek	2000	1308	--	-100%
D-8. Swan Valley	9000	618	796	+ 29%
	77963	30065	9869	

The data as shown in this table are but estimates based upon the coverage of a small per cent ($2\frac{1}{2}\%$) of the actual area covered by control, so the figures for the individual units can not be expected to be fully accurate. However, in commenting upon their accuracy it may be said that in 1929 the data from a similar survey on this Forest came within a few hundred trees of the actual number treated. Therefore there is no reason to assume that the information secured in 1930 would be any less accurate than that of the previous season.

Accompanied by Messrs. Morse and Stoddard several days were spent by the writer during the latter part of September in meeting with the forest officers who had conducted this survey for the purpose of discussing the situation as revealed by their data. From these discussions information relative to the number of trees missed during the 1930 operation, new areas of infestation, character of the 1930 attack, height and severity of attack, etc., was secured. These data were of intense value in serving to visualize existing conditions that would otherwise have been impossible unless sufficient time had been available for rather extensive field work. From these contacts it was also possible to answer many questions relative to the technique of strip surveys, which had apparently been bothering some of the field officers.

ANALYSIS OF THE 1930 INFESTATION

From the data submitted it will be seen that the 1930 infestation amounts to 33 per cent of the 1929, or a reduction of 67 per cent following the control of last May and June. These data were an unpleasant surprise as with the improved equipment available for the treating of the infested trees and the very thorough spotting accomplished, it was believed that in many areas the infestation would be reduced to such an extent that further control would not be necessary.

It is obvious that there are but two ways to account for this unexpected reinfestation that has occurred within the areas covered by control. Either there was sufficient infested bark surface left untreated within these areas to account for the 1930 infestation, or else insects are flying into the areas. Such untreated bark surface could have existed in trees missed during the operation, and through the inadequate treatment of infested trees. In considering the possibilities of missed trees thought must be given to the one-sided attack of trees where a normal brood is produced from the side attacked but the uninfested side passed by the spotter and the tree considered as being uninfested. Flights of insects would of necessity be coming from the severe epidemics of this insect within the forests to the north, or else from untreated areas adjacent to the control units.

A few notes relative to conditions within the different units, as shown in Mr. Stoddard's report, may serve to assist the reader to visualize the existing situation.

District 1

For this unit an average reduction of 47 per cent was secured. This varied from 59 per cent in Pleasant Valley to 38 per cent in the

Rattlesnake. In the Pleasant Valley and Cottonwood units the infested areas were extended to include an infestation in white-bark pine. On the Rattlesnake the trees were large and tall, and in Allen Canyon and Table Mountain (units of the Rattlesnake) the areas were not thoroughly worked. These two factors may account for the low percentage of reduction.

District 2

Though the trees in this unit are uniformly large and tall, a very satisfactory reduction of 94 per cent was secured. This is rather difficult to understand.

District 3

This unit also shows a satisfactory reduction of 91 per cent although the groups of infested trees were small and scattered over a very large area.

District 4

Though for this unit an average reduction of 46 per cent was secured, this percentage varied from a 75 per cent decrease to as much as a 68 per cent increase. Though somewhat confusing this variation can in a measure be accounted for. In the Trail Canyon, where a 67 per cent reduction was secured, the infested trees were exceptionally tall. In the Porcupine, where only a 21 per cent decrease was secured, 500 of the new attacks are on untreated territory and it was also necessary to discontinue treating operations in this area because of the fire danger. On Dry Creek, where a 68 per cent increase occurred, many missed trees were recorded by the survey.

District 5

No data available.

District 6

A reduction of 86 per cent was secured for this unit, varying from 73 to 94 per cent. No new areas uncovered, few trees missed, and trees of a character suitable for treatment by the method used. These conditions are apparently reflected in the results secured.

District 7

A reduction of 86 per cent was secured for the unit, with one area showing but 72 per cent, and the other two 100 per cent. However, in the two areas showing a 100 per cent reduction there are undoubtedly some few trees. Forest officers conducting the survey give as a reason for the reinfestation on the Kirishan Hollow-Sheep Creek area the fact that one infested area that was right in the control unit had been located which had not been covered by control. This fact would seem to account for the reinfestation on this unit.

District 3

This unit shows an increase of 26 per cent over the number of trees treated last spring. This increase is undoubtedly due to new areas discovered not previously covered by control.

The variation in the results secured throughout the Forest is a rather difficult condition to explain. There is, of course, a reason in each instance; however, such reasons can not always be accurately ascertained without a very comprehensive and detailed study of each area. With the use of the same method of control, governed by the same instruction as to the technique of spotting and treating the trees, it would seem that unless influenced by other factors, a fairly uniform result would be secured.

There are three factors that can be considered as contributing towards such a varied result. These three factors are discussed separately.

1. Method of Treatment

The success of the method of treatment used in connection with this project depends entirely upon the burner's ability to thoroughly scorch all of the infested bark surface of each tree. With the equipment in use under favorable conditions the oil can be thrown to a maximum height of 32 feet. Under favorable weather conditions, and if the burner is properly trained, the flames can be forced several feet above the height of the oil. With heavily-limbed trees that are not too tall, it is often possible to crown the fire out through the top. There can be no question but that through the use of this method infested bark surface

is left untreated on many trees. There is no way of measuring or even estimating the importance of this source of reinfestation. There is no ~~constant~~ height to which a tree is infested. A 24-inch tree may be attacked to a height of 30 feet, while the infestation on a 16-inch tree may extend to 50 feet. The extent to which this factor has contributed towards the 1930 infestation can not be determined, but it is perhaps the most important under consideration.

2. Infested Trees left Untreated

Such trees could occur as a result of being missed by the spotters or from infested areas being overlooked. It must be fully realized that it is nearly impossible, under methods which are necessary in connection with control projects, to locate all infested trees on the areas covered. One or two small areas were uncovered by the survey that had been missed entirely by the 1930 control operation, and scattered infested trees were undoubtedly left on all units. The part these two sources of infestation played in contributing towards the 1930 infestation is also practically impossible to measure.

3. Flights of Insects into the Area

A few years ago in connection with the attempted control of the mountain pine beetle in the lodgepole pine stands of the Beaverhead National Forest and in a continued study of the Montana epidemic, the potentials of this source of reinfestation have been very forcibly brought to our attention, and there can be no question but that under certain conditions this insect is capable of either flying or ~~by~~ being carried for long distances by air currents. The relation of this potential source of infestation to the project under consideration is of course unknown, as it

can not be isolated from the other factors that are rather safely assumed to have contributed towards existing conditions. Short flights of insects from untreated areas adjacent to control units are not included in the consideration of this possibility. There can be no question as to the occurrence of such short flights of insects and the concern of this problem lies in the possibility of the heavily-infested areas to the north acting as a source of reinfestation.

In connection with long flights of these insects, the writer feels that when they do occur their source is only from such heavy blocks of infestation as are now found in connection with the Montana and central Idaho outbreaks. This is but a theory drawn entirely from circumstantial evidence, and must for the time at least be considered in that light.

When other factors, such as improperly treated trees, trees missed by spotters, and areas not covered by control, etc., are considered, it would seem that they offer more tangible evidence as to the source of this reinfestation than do long flights of insects, and should receive first consideration as a possible solution to this problem. Furthermore, as conditions comparable to those of the Targhee exist on the Teton, Wyoming, Caribou, and Cache National Forests, which are still further south from the heavily-infested regions of Montana and Idaho, the possibilities of a long flight of insects being responsible for, or contributing to, the 1930 reinfestation, are indeed very remote. In this conclusion the writer does not wish to be understood as saying that flights of insects into these areas have not occurred. The possibilities of these insects being carried for long distances on favorable air currents

are fully realized and it is further believed that this factor could have contributed towards the 1930 infestation. However, in relation to this issue the writer must say "Though possible, I do not believe that it has occurred".

In summarizing the potential origin of the 1930 infestation it would seem that it has originated from a combination of sources as follows:

1. Incompletely treated trees.
2. Individual trees missed by spotters.
3. Hidden attacks missed by spotters.
 - (a) One-sided attacks viewed on uninfested side.
 - (b) Trees attacked so severely that there is no external evidence of pitch tubes and the boring dust at the base of the tree destroyed by rain and snow should perhaps also be considered as a hidden attack.
4. Missed groups of infested trees varying in size and adjacent to control units. Such groups being overlooked by spotters or else not included in project area.

RECOMMENDATIONS FOR CONTINUANCE OF THE PROJECT

1. The continuance of this project in 1931 is recommended.
2. In the institution of control for the season of 1931 on the Targhee, Teton, Wyoming, Caribou, and Cache, the project should be organized on a basis of attempting to secure as near a 100 per cent clean-up of the infestation as is humanly possible.
3. Though the actual spotting in 1930 was very satisfactory, every effort should be made to make the operation in 1931 as nearly 100 per cent perfect as possible. Spotting must under all circumstances be on

the basis of a 100 per cent coverage. This can only be accomplished by an actual stripping of all areas. The strip covered by each spotter should seldom exceed more than one chain in width, though as far as is known this width was standard procedure for all crews. The universal adoption of the use of compass lines for spotting crews, or spotting and treating crews, will add to the thoroughness of the work, and should be used in all cases.

4. Every possible effort should be made on the part of the camp manager to extend his operation into the extreme edges of his unit in order that no small patches of infestation will be overlooked.

5. The treatment of the infested trees should be on a 100 per cent basis. The economic method of control in use during the past two seasons has its field in the treatment of trees that can be successfully burned to a 6-8 inch top, or to the height of the infested length, when this can be positively determined. In all areas where trees are encountered that can not be burned for the entire infested length while standing, they should be felled for treatment. Trees felled can either be treated by spraying oil along the bole and then burned, or by piling the infested logs into decks for burning. There should be no departures from this rule, and adequate supervision must be given to the treating crews in order to be assured that this provision of the project is being executed.

6. Provision should be made by the Bureau of Entomology to examine soon after treatment a sufficient number of the trees treated by the burning-standing method to fully determine its effectiveness.

It is realized that perhaps these recommendations may be considered rather drastic and the writer again wishes to be understood that they are not to be regarded as a criticism of the project as previously conducted. As stated, under circumstances confronting the officers in charge, no sounder entomological or economical procedure could have been adopted than that conducted in connection with this project. However, it is only from the elimination of such potential sources of reinfestation as improperly treated trees, trees missed by spotting, areas not covered by control, etc., that more positive evidence will be available for the purpose of determining the source of such reinfestations as have occurred on the Targhee and other Forests during the past season. A percentage control is an unsound procedure if that portion of the infestation left untreated has the ability to rebuild into a condition comparable to the amount previously treated. A method of control costing \$2.00 per tree is a more economical procedure than one costing but \$1.00 per tree, if through the use of the latter method sufficient infestation is left untreated on the area in one shape or another to result in a reinfestation comparable in severity to that previously treated. The writer's reaction to the conditions within the Forests of this project is that the infestation is now in a condition suitable for the attempt of a 100 per cent clean-up which has been the basis for the above recommendations.

CONCLUSIONS

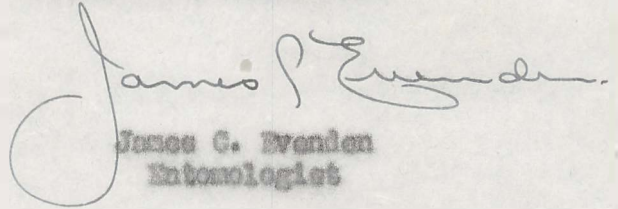
In conclusion the writer wishes to commend the forest officers in charge of the various phases of this project for the sincere and

conscientious manner in which they have attacked this problem. As the results secured have not always appeared to be as satisfactory as had been hoped, it is well perhaps to give a little thought to just what has been accomplished. For want of a more tangible method for measuring the results of control, the number of newly-attacked trees has always been compared to those treated the previous seasons, with no attempt to account for the natural increase or decrease of the infestation. Under this method, if there are half as many trees attacked the season following control as had been treated, it is assumed that a reduction of 50 per cent was secured, and by the same reasoning if by any chance there should have been more trees attacked than had been previously treated, it is necessary to assume that the work be considered a failure and that no benefits were derived. Such a method of measuring the results of control is not sound, for if control is instituted at a time when an outbreak is subsiding then an inflated value is given to the operation, while if launched against a rapidly-increasing epidemic the project stands a fair chance of being considered a failure when in reality greater benefits are derived.

It would seem that the only equitable method would be to attempt a comparison of the number of trees treated, to what the infestation would have been had no control work been instituted. To measure the results of the project under discussion, and in using the Targhee for an example, it is more than safe to assume that had no control been instituted there would have been at least a 300 per cent

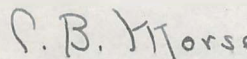
increase. Under this assumption there would now be some 90,000 infested trees on the Burghes instead of the present infestation of 9,000, which is actually a decrease of 90 per cent for the entire Forest.

Respectfully submitted,


James C. Evenden
Entomologist

October 31, 1930

Approved:


C. B. Morse
Assistant Regional Forester